Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 17 (2): 347–351
https://doi.org/10.15560/17.2.347

PENSOFT

Diplotemnus balcanicus (Redikorzev, 1928) (Pseudoscorpiones, Atemnidae) rediscovered in Slovakia after 65 years

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Abstract

Diplotemnus balcanicus (Redikorzev, 1928) is reported for the second time from Slovakia. The species was first recorded from Slovakia in 1955 when two specimens were found in bat guano on the loft inside a church. After 65 years, one male was discovered inside a private family home 8 km from the 1955 record. The original 1955 material of *D. balcanicus*, from a private collection, has been revised. Additionally, a short description of the male of *D. balcanicus* and some identification notes on Eurasian diplotemnids are provided.

Keywords

Distribution, Europe, faunistics, introduction, taxonomy

Academic editor: Yuri Marusik | Received 13 October 2020 | Accepted 22 January 2021 | Published 3 March 2021

Citation: Krajčovičová K, Červená M, Gajdoš P, Christophoryová J (2021) *Diplotemnus balcanicus* (Redikorzev, 1928) (Pseudoscorpiones, Atemnidae) rediscovered in Slovakia after 65 years. Check List 17 (2): 347–351. https://doi.org/10.15560/17.2.347

Introduction

The pseudoscorpion family Atemnidae contains 22 genera, of which 21 are Recent and one is from Eocene Baltic amber (Harvey 2013; Dunlop et al. 2020). Due to the poor definition of many genera which show only slight differences between them, Klausen (2005) called for more a transparent classification and revision of the family, which has not been carried out until recently.

Atemnids are found in most regions of the world, with their centre of diversity in the tropics and subtropics (Harvey 2013). In Europe, representatives of the family are few: *Atemnus politus* (Simon, 1878), *A. syriacus* (Beier, 1955), *Diplotemnus balcanicus* (Redikorzev, 1928), *D. pieperi* von Helversen, 1965, and *Mesatemnus cyprianus* (Beier & Turk, 1952) (Harvey 2013; Novák and Harvey 2015).

The genus *Diplotemnus* comprises 10 species (Harvey 2013). *Diplotemnus balcanicus* is distributed throughout northern Africa, Asia, and southern Europe, with isolated findings in central and eastern Europe (Harvey 2013; Novák and Harvey 2015; Krajčovičová et al. 2018). *Diplotemnus pieperi* has been recorded only from the Salvage Islands, Portugal (von Helversen 1965), and *D. egregius* Beier, 1959 occurs in Afghanistan and Tajikistan (Harvey 2013). Except for these three diplotemnids, all other species of *Diplotemnus* are restricted to French Southern and Antarctic Lands, Guinea-Bissau, Namibia,

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South Africa, and the United States (Harvey 2013). *Diplotemnus balcanicus* has lately undergone taxonomic revision, where *Chelifer söderbomi* Schenkel, 1937, *Diplotemnus insolitus* Chamberlin, 1933, *D. vachoni* Dumitresco & Orghidan, 1969, and *Miratemnus piger* var. *sinensis* Schenkel, 1953 were proposed as junior synonyms of *Chelifer balcanicus* Redikorzev, 1928, which was transferred from the genus *Rhacochelifer* to form a new combination, *Diplotemnus balcanicus* (Redikorzev, 1928) (Novák and Harvey 2015).

Diplotemnus balcanicus was recorded for the first time from Slovakia under the name *Diplotemnus piger* (Simon, 1878); two specimens, a male and immature female, were found in the guano of mouse-eared bats, *Myotis myotis* (Borkhausen, 1797) and *Myotis blythii* (Tomes, 1857), in the loft of a church in the village of Chľaba in 1955 (Verner 1959). Herein, we report a new locality of *D. balcanicus* in Slovakia and also to provide morphological data on our specimen.

Methods

A single specimen of *Diplotemnus balcanicus* was found in a hallway inside a private family home in the village of Kamenica nad Hronom (Fig. 1). The house and the parcel borders on the Burdov National Nature Reserve and the area of the village used for gardening. The specimen was collected by hand during research which focused on the tracking of synanthropic arachnids. The specimen has been preserved in 75% ethanol. The specimen was immersed in lactic acid for clearing and studied on a temporary slide mount. After the study, it was rinsed in water and returned to 75% ethanol. Morphological and morphometric analyses were performed using a Leica DM1000 compound microscope with an ICC50 camera module (LAS EZ application, 1.8.0). Measurements were taken from digital images using the AxioVision 40LE application. Digital photographs (Fig. 2) were taken using a Canon EOS 5D Mark II camera attached to a Zeiss Axio Zoom V16 stereomicroscope. Image stacks were produced manually, combined using Zerene Stacker software, and edited in Adobe Photoshop CC.

The specimens collected from the village of Chľaba in 1955 were preserved as permanent slide mounts using Canada balsam. As the permanent slide mounts were in poor condition, they were melted in xylene, rinsed in water, and the specimens preserved in 75% ethanol.

The pseudoscorpion specimens were identified using the key by Christophoryová et al. (2011). Nomenclature and mensuration mostly follow Chamberlin (1931) and Harvey (2013), with the exception of the terminology of the rallum, pedipalpal and pedal segments (Harvey 1992; Judson 2007).

The new specimen is deposited in the zoological collection of the Natural History Museum in Vienna (NHMW). The specimens from 1955, in the collection of Dr Petr H. Verner (Verner 1959), is in the private collection of Dr František Šťáhlavský, which is currently deposited in the Department of Zoology, Faculty of Natural Sciences, Charles University, Prague, Czech Republic.

Results

Atemnidae Kishida, 1929

Diplotemnus balcanicus (Redikorzev, 1928)

Chelifer balcanicus Redikorzev 1928: 120, fig. 1, presumably ♀.
Diplotemnus balcanicus—Novák and Harvey 2015: 316 (transferred to *Diplotemnus*).

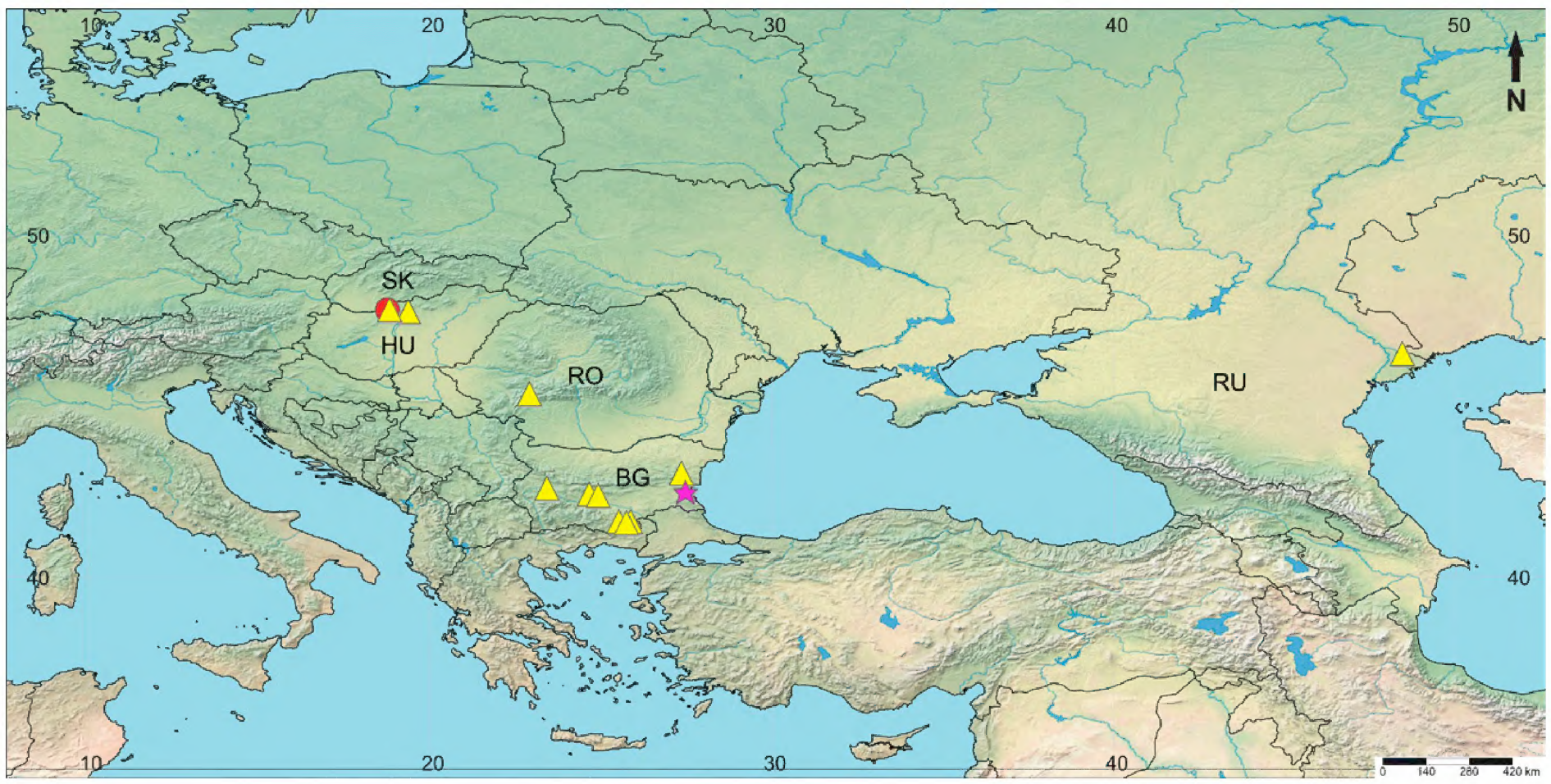

Figure 1. Distribution of *Diplotemnus balcanicus* in continental Europe (red circle = new record in Slovakia, purple star = type locality, yellow triangles = published records). Abbreviations: Bulgaria (BG), Hungary (HU), Romania (RO), Russia (RU), Slovakia (SK).

Diplotemnus piger (Simon, 1878) sensu Beier 1930—Verner 1959: 61–63 (first record in Slovakia; synonymised with *D. insolitus* by Dashdamirov and Schawaller 1993: 7; specimens examined).

Type locality. BULGARIA • Northern Thrace Region, Burgas Province, Burgas; 42°30′N, 027°28′E (Redikorzev 1928) (Fig. 1).

Material examined. SLOVAKIA • Nitra Region, Nové Zámky District, Kamenica nad Hronom village (Fig. 1); 47°49′31.4″N, 018°44′53.5″E, 140 m; P. Gajdoš and V. Hošek leg.; 28.X.2019; in a hallway inside a private family home; 1 ♂, NHMW 29571 • Nitra Region, Nové Zámky District, Chľaba village (Fig. 1); 47°49′N, 018°49′E; K. Hůrka leg.; 3.VII.1955; 1 ♂, 1 tritonymph, collection of Dr František Šťáhlavský, Department of Zoology, Faculty of Natural Sciences, Charles University, Prague, Czech Republic.

Short description. Adult male (Fig 2). Carapace and tergites yellowish brown, pedipalps reddish brown (Fig. 2A). Setae on body and pedipalps apically dentate. **Carapace**: 0.98 × longer than broad, strongly granulated, with 1 pair of eyes and 2 transverse furrows (Fig. 2B); anterior disk with 36 setae and 2 lyrifissures in ocular area, medial disk with 19 setae and 2 lyrifissures near posterior transverse furrow, posterior margin with 13 setae. **Chelicera**: 1.90 × longer than broad; 5 setae and 2 lyrifissures on hand; moveable finger with 1 seta; galea with 4 rami; serrula exterior with 21 blades; rallum consisting of 4 blades. **Coxae**: chaetotaxy: manducatory process with 4 acuminate setae, rest of pedipalpal coxae with 15+16 acuminate setae and 1 pair of median maxillary lyrifissures; pedal coxae I–IV each with acuminate setae: 7+7: 9+9: 6+6: 16+right pedal coxa IV damaged. Microlyrifissures on pedal coxae I–IV: 4+4; 6+6; 5+6; 7+right pedal coxa IV damaged. **Pedipalp**: robust, coarsely granulate (Fig. 2C). Trochanter 1.56 ×, femur 2.84 ×, patella 2.37 ×, chela 2.98 ×, hand with pedicel 1.98 × longer than broad. Chelal hand widest in its proximal part, chelal finger shorter than hand without pedicel. Venom apparatus present only in fixed chelal finger. Fixed chelal finger with 8 trichobothria, moveable finger

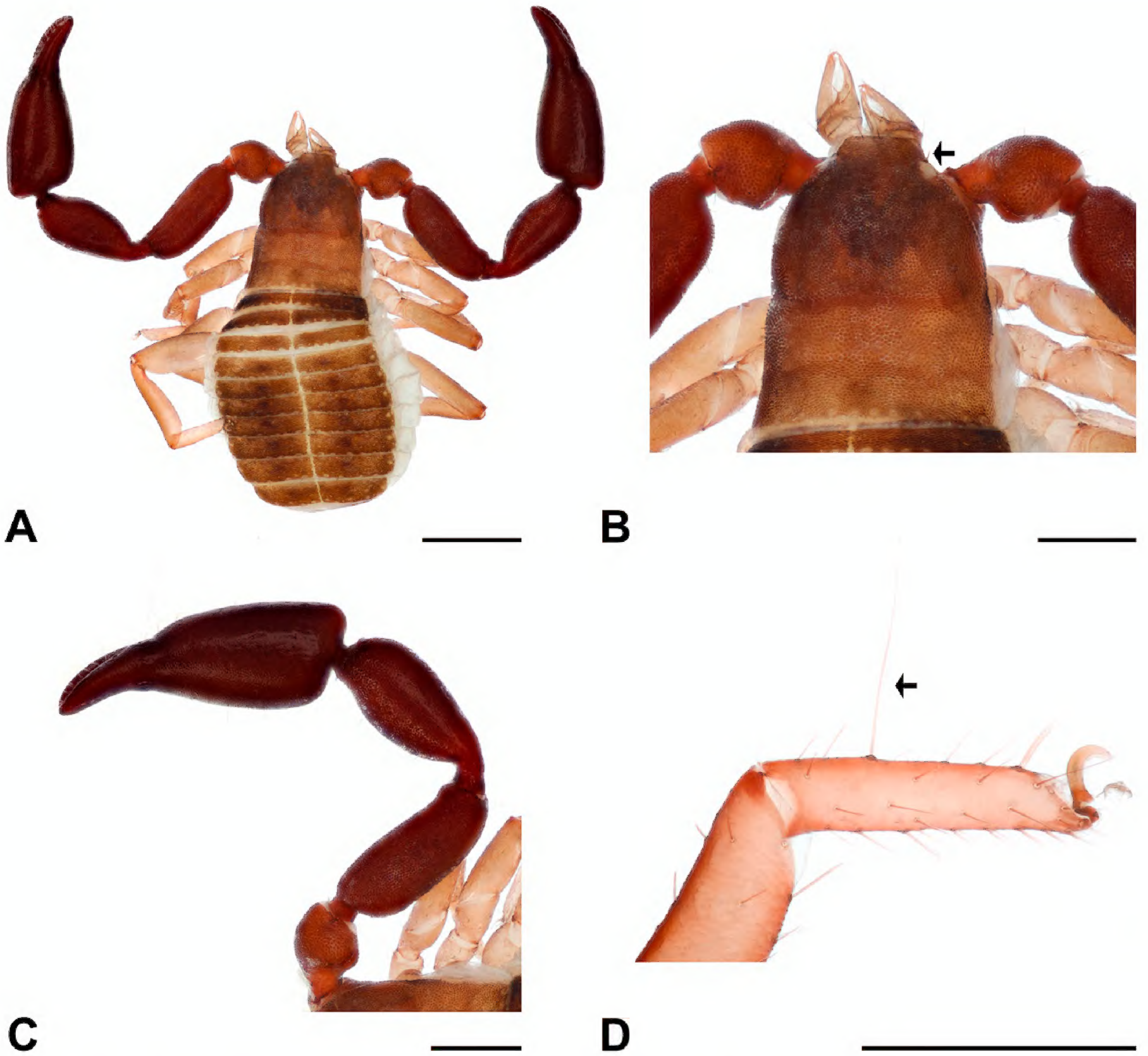

Figure 2. Some morphological characteristics of *Diplotemnus balcanicus*. **A.** Male, dorsal view (scale bar = 1 mm). **B.** Detail of carapace, arrow points to preocular seta (scale bar = 0.5 mm). **C.** Detail of pedipalp (scale bar = 0.5 mm). **D.** Detail of tarsus of leg IV, arrow points to tactile seta (scale bar = 0.5 mm).

with 4 trichobothria. Fixed finger with 29 marginal teeth; moveable finger with 31 marginal teeth. **Opisthosoma**: tergal chaetotaxy: I–X with leaf-like setae: 6+6: 5+5: 5+6: 6+7: 7+7: 6+7: 6+7: 7+7: 6+6: 6+6: tergite XI damaged. Tergal lyrifissures: I–X: 5+6: 4+4: 5+5: 4+5: 6+8: 5+4: 7+7: 8+8: 6+5: 6+7: tergite XI damaged. Sternal chaetotaxy: III–XI: anterior genital operculum damaged: 12: 5+5: 6+5: 6+6: 7+6: 5+6: 7+5: 6+5: 3+3, 2+2 tactile setae. Sternal lyrifissures: III–XI: anterior genital operculum damaged: 4: 9+9: 20+17: 20+19: 20+19: 12+13: 9+9: 7+7: 52+47. Genitalia not studied in detail. Anal opercula with 4 short acuminate setae. **Leg I**: trochanter 1.30 ×, femur 1.10 ×, patella 2.52 ×, tibia 4.37, tarsus 4.5 × longer than deep. **Leg IV**: trochanter 1.81 ×, femoropatella 3.63 ×, tibia 5.16 ×, tarsus 4.13 × longer than deep. Tactile setae on tarsus of leg IV present, situated between the basal third and the middle of the segment; claws simple; arolia shorter than claws (Fig. 2D).

Dimensions. (length/width or, in the case of the legs, length/depth in mm). Body length 3.75. Pedipalp: trochanter 0.61/0.39, femur 1.25/0.44, patella 1.21/0.51, chela 1.85/0.62, hand with pedicel 1.23/0.62, hand without pedicel 1.08/0.62, fixed finger length 0.78. Chelicera 0.40/0.21, moveable finger length 0.32. Carapace 1.37/1.39. Leg I: trochanter 0.30/0.23, femur 0.32/0.29, patella 0.68/0.27, tibia 0.70/0.16, tarsus 0.54/0.12. Leg IV: trochanter 0.49/0.27, femoropatella 1.20/0.33, tibia 0.98/0.19, tarsus 0.62/0.15.

We revised the specimens from 1955, revealing them to be a male and tritonymph of *D. balcanicus*.

Identification. *Diplotemnus balcanicus* can be clearly distinguished from other diplotemnids distributed in Eurasia by following characters: from *D. pieperi* by the number of preocular setae on the anterior margin of the carapace [one in *D. balcanicus* (Fig. 2B) vs. three in *D. pieperi*] and by the ratio of length to breadth of the pedipalpal chela [2.98 in *D. balcanicus* (Fig. 2C) vs. 2.40 in *D. pieperi*] (von Helversen 1965); from *D. egregius* by smaller sizes [e.g. 0.99–1.25 pedipalpal femur length and 1.08–1.21 pedipalpal patella length in *D. balcanicus* vs. 1.45–1.65 and 1.45–1.55 in *D. egregius*] (Beier 1959, 1963; Dashdamirov and Schawaller 1993).

Discussion

Diplotemnus balcanicus was recently discovered in Hungary in owl pellets and bat guano in a church tower (Novák and Harvey 2015). In Slovakia, both findings were recorded from synanthropic habitats: first in the loft of a church (Verner 1959) and now inside a private family home. The new record is only 8 km from the locality of the 1955 record. Petrov (2004) reported *D. balcanicus* introduced in a house in Bulgaria. Some available information indicates that this species might be spread phoretically, which Beier (1963) has already suggested. Phoresy has been observed by Beier (1930), who found specimens attached to lepidopterans. Krajčovičová et al. (2018) recorded *D. balcanicus* attached to the plumage of a dead specimen of Black-headed Gull, *Chroicocephalus ridibundus* (Linnaeus, 1766), in Russia. Dumitresco and Orghidan (1969) reported that *D. balcanicus* is often found in caves in Romania. There are also records of *D. balcanicus* from Afghanistan, Azerbaijan, Kyrgyzstan, Iran, and Turkmenistan, where it has been collected from leaf litter, under stones, and under tree bark (Beier 1959, 1971; Schawaller and Dashdamirov 1988; Schawaller 1989). Schawaller (1989) also recorded it from Great Gerbil, *Rhombomys opimus* (Lichtenstein, 1823), nests in Turkmenistan. Older publications unfortunately make no mention of the habitats of *D. balcanicus*.

Our new record of *D. balcanicus* confirms its distribution in southern Slovakia. This species is currently known in continental Europe from Bulgaria, Hungary, Romania, Russia, and Slovakia (Redikorzev 1928; Dumitresco and Orghidan 1969; Petrov 1997, 2004; Novák and Harvey 2015; Krajčovičová et al. 2018) and northwest as far as southern Slovakia, eastern to the Volga River delta, and south to southern Bulgaria (Fig. 1).

Acknowledgements

We are very thankful to Vladimír Hošek, who collected the new record of the studied pseudoscorpion. Special thanks belong to František Šťáhlavský, who kindly loaned us the 1955 material from his private collection. We would like to thank our friend Dávid Selnekovič for technical assistance with figures and the reviewers, Ilya Turbanov, Srećko Ćurčić, and one anonymous reviewer, for valuable and constructive comments which improved the quality of the paper. This research was financially supported by the VEGA grant 1/0704/20.

Authors' Contributions

KK identified the specimen, wrote the manuscript and created the map. PG collected the specimen. JC and MČ measured the specimen and revised the text. JC prepared the composite Figure 2.

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